

# Advanced, low-cost electric motors key to hybrid electric vehicle success



## O A A T A C C O M P L I S H M E N T S

### Low-Cost Electric Motor Manufacture

#### Challenge

Small, low-cost electric motors are critical to enabling hybrid electric vehicles to achieve greatly increased fuel economy and significantly reduced emissions over conventional vehicles. The current technology presents challenges in size, efficiency, and cost. The U.S. Department of Energy's Automotive Electric Motor Drive (AEMD) Program is pursuing manufacturing process development to reduce the unit cost of the electric motors.

The focus of the development effort described below is to research low-cost manufacturing methods and produce a production prototype for 30-kW motors at a target unit cost of \$450 and 15-kW motors at a target unit cost of \$300.



*High-speed lamination stacking method for low-cost stator core manufacturing.*

#### Technology Description

Several machine designs and advanced manufacturing technologies are being investigated. Delphi Automotive Systems is focused on a basic motor configuration with the transmission being used for detailed analysis of alternative rotor and stator designs for different electric machine technologies.

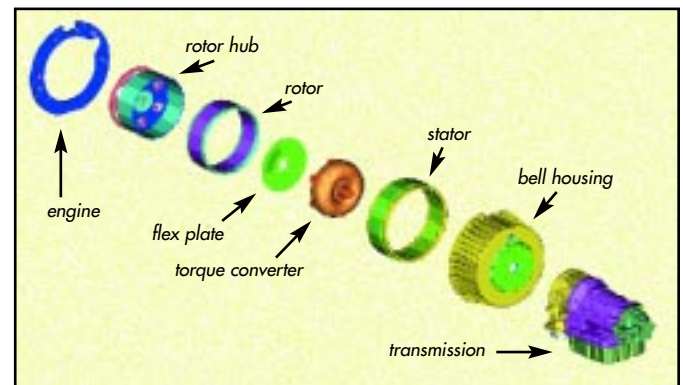
through verification of a salt bath system. Preliminary thermal, noise, and finite element analysis performance testing has been completed. A "gap analysis" was performed to assess areas that need additional emphasis.

#### Benefits

The motor design offers several advantages and provides robust power transfer capabilities between the engine and the machine. A wrap-around design minimizes parts count and results in reduced system weight.

#### Accomplishments

During FY 2000, Delphi evaluated machine designs and manufacturing technologies for induction, permanent magnet, and switched reluctance motors. Development was conducted for high-speed lamination stacking processes in an effort to produce a low-cost stator core. Multiple wire stripping was successful



*Configuration.*

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## ***Future Activities***

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A cost comparison report for different machine technologies will be finalized, and a machine technology will be selected. The proof-of-concept motor build, test, evaluation, and delivery will be completed in FY 2001. Production prototype motors will be delivered in 2002.

## ***Partners in Success***

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- Delphi Automotive Systems
- Electricore, Inc.

